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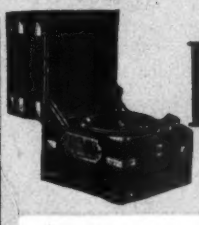
The AMERICAN HOROLOGIST



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FOR ADVANCEMENT IN TIMEKEEPING

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Vol. 9 JULY, 1942 No. 7

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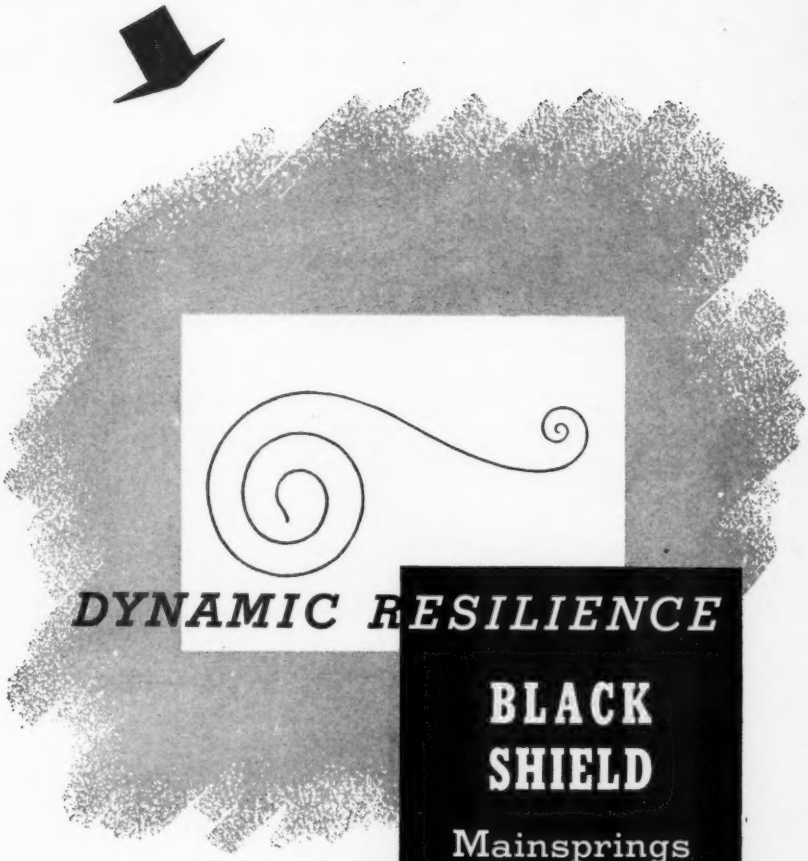

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NINTH YEAR OF PUBLICATION

The AMERICAN HOROLOGIST

Incorporating HOROLOGY

Published Monthly

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ODD But TRUE

By Weil

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ISOCHRONISM

By WALTER J. KLEINLEIN, *Waltham Watch Company*
(Technical Talk UHAA)

Isochronism is one of the three principal adjustments with which horology deals, namely and in order, Temperature, Isochronism and Positions.

These adjustments are all concerned in the accuracy of better timepieces and when the variation permitted is very small the required skill of the horologist becomes more exacting.

It is not sufficient to place a quality watch in going order and then depend upon the regulator for consistent performance. That produces results when the watch is in original proper condition but not when damage through wear or carelessness is present.

It is necessary that the mechanism be properly made and assembled and that the escapement, balance and hair spring be in recognized good order. It is also necessary to understand what to do to coordinate irregular reactions so that the intended accuracy of the watch may be reasonably assured under different conditions.

I have chosen the subject of "Isochronism" for this occasion because it contains important elements in timekeeping, the most common of which will be discussed in the short period allotted.

What Is Isochronism?

First let us answer the question "What is Isochronism"? As applied to horology it means uniform timekeeping over a given period.

Pocket and wrist watches are nearly all made to be wound once each day; this period of 24 hours is therefor the unit during which uniformity is chiefly concerned.

When a watch is set to the second at a given time and is found to be exactly on time at the end of 24 hours it does not indicate that it is adjusted to isochronism. Why?

Because the rate of timekeeping may not have been uniform during the period. For example, it may have gained time during the first hours after winding and lost time during the latter hours of the 24 hour run.

The isochronal error of a well adjusted pocket watch should not exceed two seconds over a 24 hour period while a lower grade or a wrist watch may have an error of 15 or 20 seconds and be considered satisfactory in its class.

How Scientific Tests Are Made

The average watchmaker frequently considers explanation of isochronal variation through graphic charts as purely academic and not directly associated with his work at the bench.

It is quite true that such charts border on the scientific in any branch of adjusting, but they do supply a means of recognizing certain types of timekeeping variation which otherwise remains obscured.

The graphic curves vividly point out the direction and extent of the error and to the experienced present an enlightened clue as to the nature and extent of practical alterations required.

It is practical to make the test in both the horizontal and vertical positions. The horizontal indicating almost exclusively the isochronism of the spiral spring while the vertical covers frictions, poise, motion and the spring.

The periods of observation for chart readings and recordings depend upon the desired accuracy of adjustment. For example the highest grade tests in the Geneva Observatory have in the past received hourly readings from the time of winding until the watch runs down.

The Bureau of Standards in Washington requires readings of three hours. Examination of Bureau of

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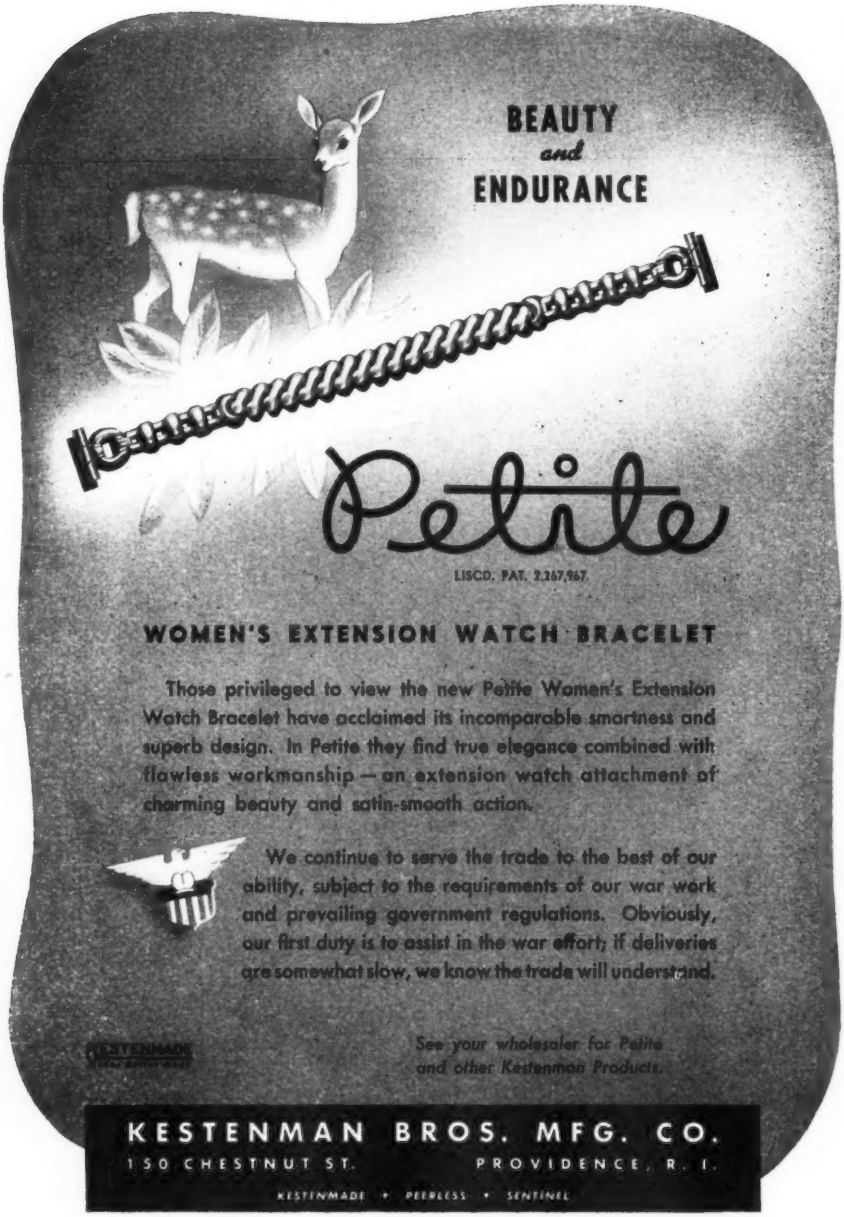
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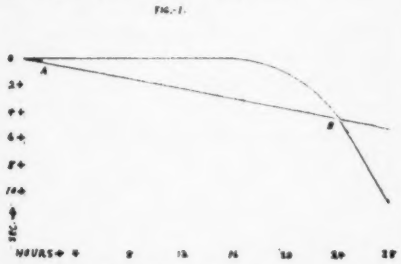
Standards tests also show readings until the watch runs down.

Such tests contain important information and the direction of the curve for at least some hours after the 24 hour period shows what may be expected of the watch when regularity of winding is neglected.

Example of an Isochronal Rate As Illustrated by the Chart

Before proceeding to practical alterations we will use the blackboard to illustrate the chart method of analyzing the isochronal curve of a high grade pocket watch with a large error in the short arcs.

Each vertical square of the chart represents seconds and horizontally the squares represent hours.



When the curve rises from the zero line the rate is gaining and when it falls below the zero line it means the rate is losing.

The symbols − and + are used to indicate the number of seconds correction necessary to bring the watch to true time.

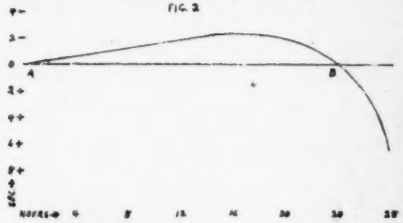
The method of obtaining the rate and curve is as follows: The watch was wound and set to the second; readings were made in periods of 8 hours in the vertical 12 up position. During the first 8 hours there was no variation; at the end of 16 hours the watch was still exactly on time and at the end of 24 hours it was 4.5 seconds slow. It was allowed to run four additional hours or 28 hours in all at which time the watch was 11 seconds slow. Graphic chart record ing would be as follows:

Figure 1.

The curve in Fig. 1 illustrates the isochronal error. The first 16 hours during which there was no variation are shown by a straight line from zero to 16 hours. The third period of 8 hours is illustrated by the curve.

The line A-B bisecting zero and the end of 24 hours points out the loss of 4.5 seconds by indicating the seconds from the 24 hour crossing straight up to the zero line.

The curve below the 24 hour crossing point shows the loss of 6.5 seconds during the four hours subsequent to the 24 hour run. The number of seconds loss in the additional four hours may be ascertained by measuring from the 24 hour bisecting point straight down to the horizontal line on which the curve ends.



Regulation

Let us see what will happen to the curve if we regulate the watch to run faster so that the 24 hour bisecting A-B line will be exactly on the zero line.

The isochronal curve will then appear as in Figure 2. The first 16 hours will show a steady gain of 2¼ seconds.; the last 8 hours will show a loss of 2¼ seconds. By adding the gain and loss we have a total of 4.5 seconds or the same isochronal error as shown by the curve in Figure 1.

During the four hours additional run following the 24 hour period the curve shows that the accelerated loss of 6.5 seconds is still there. Theory and practice are in accord in that the isochronal rate whether slow or fast cannot be eliminated by regulation.

Figure 2:

How Can Isochronal Variation Described in the Chart be Improved or Corrected?

Corrections for the amount of iso-

chronal variation described in the chart consist chiefly of hair spring alterations. One essential of an isochronal spring is of course that the terminal points of attachment must be so related as to cause the long and short arcs of the balance to be made in equal time.

In larger models this is much more effective than in small models. The exact point of attachment of the inner terminal must be based on isochronal theory and then ascertained for a certain model by experience gained through experiment with that model.

When this point has been ascertained and it is found that some units do not respond it is necessary that the adjuster make alterations that will bring results.

Such corrections consist of alteration of the terminal points or through changes in the overcoil to obtain a faster or slower short arc rate.

The overcoil alterations consist of making plus or minus bands such as described by Phillips in his many illustrations of isochronal curves.

A slow rate of 5 or 6 seconds may easily be improved by introducing a plus bend. This means the straightening of a segment of the radial part of the overcoil. A bend of this decription is made by means of one or two short curves based on the amount of correction required.

The isochronal error described by the graphic curves calls for an alteration such as shown in Fig. 3. The broken line illustrates the radial or minus curve of the overcoil and the solid line the correction, which is known as a plus curve.

Figure 3.

The function of a plus curve is to cause the short arcs to be quickened due to decreased resilliency of the metal as the mainspring power decreases. Should the rate be fast in the short arcs instead of slow the alterations would be reversed and a minus curve (more radial) would be required.

There are various combinations of isochronal alterations but the above gives a brief idea of a practical example.

FIG. 3

It is essential that the watch be in order, the pivots polished and regulator pins properly adjusted before making hairspring alterations.

How Can the Repairer Detect Extreme Isochronal Variation Without the Use of a Chart?

The cause of Erratic timekeeping can often be traced to the most common type of ischronal variation consisting of out of poise, regulator pins not properly fitted to the overcoil or hairspring not centered.

Watches of this description are purely bench problems whether the trouble is due to poor work or damage. Charts have no place nor are they of commercial advantage in such instances.

The repairer can become acquainted with this condition by comparing the vertical rate of a watch during the first few hours after winding with the rate in an equal number of hours during the last part of the 24 hour run.

The periods may be 4-6 or 12 hours; the importance is to get the rate at two equal extremes of the 24 hour run and the watch may be either a pocket or wrist watch.

For preliminary work the mainspring may be let down to obtain the approximate rate of the second period. If a timing machine is available the comparison may be obtained even more quickly.

This takes very little extra time

and the information obtained will often prove to be a surprise in demonstrating why some watches are erratic. The way for improvement is then open.

I have seen watches nicely cleaned and oiled, they had been cleaned several times and were still erratic. It was clearly evident that further cleaning could not correct the poor rate which was due to other trouble such as mentioned above and which was repeatedly overlooked.

What is the Most Common Error Found in Extreme Isochronal Variation of Wrist Watches?

The primary cause of extreme isochronal variation in wrist watches consists of out of poise and irregular arc of motion. The out of poise may be due to the replacing of a balance staff, screws filed to correct the mean time or setting of the balance rims.

The poise of small balances is more easily damaged than that of the larger balances and the same amount of error has greater effect on the timekeeping.

Whatever the cause may be, it is unfortunate that too many watchmakers fail to remove the hairspring from small balances, examine and polish pivots and see that the balance is true and in poise.

Mainsprings of small watches set more quickly than those of larger watches and variation in the arc of motion is more frequent. For this reason the springs are changed more frequently presenting an opportunity of replacing a spring too strong or too weak. This combination error of poise and motion produces the most erratic type of isochronal variation.

For example: If the balance is heavy above when at rest and the arc of motion is 1¼ turns or over, the watch will gain time and when the arc drops to one turn or less later in the 24 hour period, the same combination will produce a loss in time.

If the heavy part of the balance is at the bottom when at rest the variation will be in reverse of the above. This variation may cause an error of several minutes and be difficult if not quite impossible to regulate to satisfactory timekeeping.

In conclusion I shall make this definite statement; that if the hairspring is removed from small watches and the poise checked there will be less extreme isochronal variation and the work in general will better serve the house, the customer and the watchmaker.

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An Amateur's Experience in Making A Spring Detent

W. Barclay Stephens, M. D.

When an amateur horologist attempts to make so difficult a part as a spring detent, he needs more tools than the professional and usually has fewer. This lack he may supply by purchase or by devising and making. The latter procedure was followed in this instance.

After two futile attempts to make a detent without a jig to hold the stock, the desirability of such an appliance was thoroughly brought home. But to make the jig, some milling was necessary, and this required a vice which could be attached to the lathe bed.

The vise was made from an iron casting, 2¾ x 2¾ x1½", the central portion being cut out, leaving the bed 9-16" thick, and the side walls 7-16". One side wall serves as the fixed number of the vise, the movable number being a block of steel ¾" x 7-8" x 2¾". Two ¼" holes were drilled through the 7-8" side of the block, corresponding to similar holes in the side walls to receive two ¼" machine bolts, upon which the block rides.

The other side wall was drilled and tapped for three ¼" cap screws, which serve to force the steel forward for clamping the work.

A bolt, through the center of the bed, with its head counter sunk, holds the vise firmly to the bed of the lathe.

The vise held the jig stock securely, but the milled cut proved to be so long that the belt driving the mill became alternately too loose or too tight.

To care for this contingency, an idler take up had to be made. This consisted of two wheels with ball bearings, each wheel mounted upon an arbor set at right angles at one end of a lever. The fulcrum is an arbor over which the lever slips easily. Around the arbor is coiled a small clock spring with its inner end attached to the arbor and its outer end attached to the other end of the lever. The lever engages against a movable pin, which determines the angle at which the lever is held. The action of the spring is upward on one wheel and downward on the other. The upward acting wheel carries the lower member of the belt upon its upper surface, and the downward acting one, the upper member of the belt. The wheels keep the belt at a constant tension, and also by their crossing action tend to cause the belt to encircle the pulley wheels on the motor and on the milling attachment.

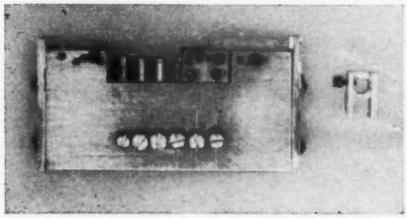
The jig was made from a piece of brass, ¼" x 1" x 2". Lengthwise across the top was milled a groove 3-16" x 3-16". Then the central inch of the groove was cross milled out to a depth of 5-32"; thus leaving ½" of the groove at each end. Down through the floor of the cross milled portion were drilled six 1-16" holes. These holes were redrilled from above with 1-8" drill, part way down, thus leaving a shoulder in each. Posts were turned with shoulders so placed that when their shoulders rested upon the shoulder of the holes, their tops were level with the floor of the central portion. A set screw was placed for each post, to retain it at any desired height.

Two supplementary pieces, 3-8 of an inch long, were made which may be placed at each end of the central cut out—using one reduces the working space to 5-8" and two to ¼".

Set screws hold these in place on the upraised pillars. Along the side of the 3-16" groove, as well as the supplementary pieces are set screws to hold the stock. All screws are placed on one side, thus leaving the other free so that it may be laid upon the table of the filing device.

At each end of the jig is placed a piece of brass, carrying a conical 45 degree hole in its upper end. These enable one to swing the fixture between centers, and thus have a swing filing fixture. Since the pieces are

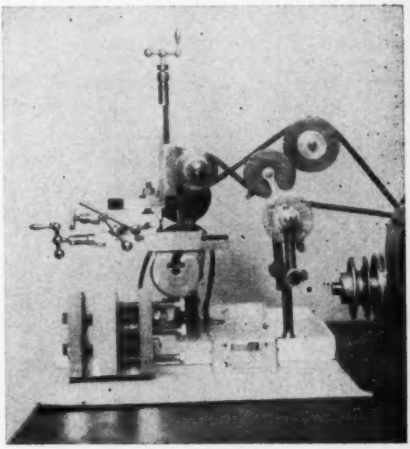
held by screws which go through slots in the pieces, the jig may be adjusted to such a height as to be on a level with the surface to be filed. In case the work is less than 3-16" in diameter, small pieces of brass may be used to fill in before set screws are screwed up.



The Jig, the Detent, and the Extra Supports

The actual making of the detent was preceded by meticulous measurements. The stock was 3-16" square drill rod. This was first coated with Prussian blue, that the measurements laid out upon it might the more readily be seen. Saw cuts were then made, the first marking the location of the foot plate, and then one on each side, defining the foot plate end of the spring. The under side was now filed off to such a depth as to clear the escape wheel. At the "horn" end, 3-16" extra was left, and the piece cut off from the drill rod. This piece of detent stock was then set in wax chuck and the "pipe" hole drilled. While still in the wax chuck, the pipe was partially turned. The foot plate was then completed and the hole drilled and tapped for the hold down screw.

Placed in the jig with the top side up, the pipe was finished and the top filed down. The detent was then turned in the jig with the side up which was to carry the boss for the gold spring. With the filing fixture this side was taken down almost as far as it was to go. This procedure outlined one side of the spring, the boss and one side of the horn. Reversing in the jig, the other side was turned up and the posts set at such a height as to support the detent, and again upon the filing fixture this side was filed down, almost to its proper thickness. The spring at this stage was 1-10 mm thick. The boss was drilled and tapped for the screw for holding the gold spring. The detent was now hardened in oil and then drawn to spring temper by heating in oil until the oil took fire.



The Vise, the Jgi, and the Idler Take Up

The grinding down to size was done with an iron slip and oil stone powder, and the polishing with a tin slip and diamantine. The spring was ground to a thickness of .06 mm. When the process was almost complete, the horn was parted from the block of stock at that end. During all the difficult procedure, the posts were adjusted to support the detent.

The gold spring was made from a piece of 14 K gold wire flattened with a hammer

The locking stone was made from a large impulse roller jewel, one side being ground off with a diamond lap.

The larger photograph shows the vise, the jig, and the idler take up. Slightly to the left at the upper edge of the plate which fits over the arbor of the lever of the lower wheel may be seen the movable pin which holds the lever at a suitable angle. This circular plate has holes drilled

around its edge, any one of which may be used for the movable pin. The plate also serves the purpose of keeping the spring flat. The upper wheel is mounted in the same manner as the lower, but its mountings cannot be seen, since it lies behind the lower wheel.

The other photograph shows the jig with finished detent supported by the movable pillars.

Watch Out

By JODIE TINKER

I placed the old 1942 model, 17 jewel movement, on the bench in front of me, placed the eye-loop to my eye, and proceeded to try to find out what had made it tick for the past twenty years. In this year 1942 things are going pretty hard for me, because of the first mistake I made as watchmaker, was not attending some accredited school of Horology, I thought that all one needed to successfully work on watches was just experience, but now in my old age I find to my sorrow that I should have studied the theory, the science, and the technical knowledge anyone needs to be a successful watchmaker.

I don't know what made ths old wreck run but it did, its face was stained by too much handling the bridges were all scratched and tarnished and the heads of the screws were badly worn, the hair spring had more kinks in it than a jack-rabbit's hind leg. The balance wheel had graceful curves like a bathing beauty, but like some bathing beauties it curved out too much in some places and not enough in others. But strange as it may seem, it still ticked, thanks to about thirty cleanings in the last twenty years, with a little oil in some places some times.

Suddenly the yellow signel flashed a warning then came the pink alert sign and finally the red signal showed that a customer had at last entered my shop.

WE ASK YOU TO BE PATIENT

We are doing our best to supply the watch trade with all the lubricants they need, but we must

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I welcomed him in like a spider welcomes a fly and asked to see his timekeeping mechanism. He pulled out one of those modern things, and I do mean modern it was so modern it was a cross between a tear-drop and a glass eye. Its case was a two piece hermetically sealed metal that was as clear as glass, this was filled and sealed at the factory and the works operated in a lubricant as clear as a crystal all parts were streamlined to cut down friction. There were no jewels because the glass clear metal was harder than jewels. The works was a masterpiece of theory, science, and technical skill combined. Its main spring was wound by means of centrifical force. If you drove a car and turned the corners on two wheels, the watch never required winding. If you owned an airplane and could come out of a dive at eight times gravity, your watch would run for years with out rewinding.

I told the customer I could drain its crankcase and refill with fresh lubricant for $5.00, he frowned, looked at my tweesers, eyeloop, and beat up screwdrivers and said, "O K I'll take a chance Columbus did."

When he left I took his watch to a good Horologist who fixed it up for me for $4.00 and I made a $1.00 profit and I am still eating, and whats more I didn't give a tinker's damn, until I started to study horology.

Worcester Guild

The regular monthly meeting of the Worcester and Worcester County Horological Association Guild No. 2 was held June 1 at the Aurora Hotel. A report on the recent national convention at Chicago was given by J. Edward Bogage, Chairman of the National Board of Trustees.

Warren Frazer discussed the second lesson "Steel and Its Treatment." Gustaf Hanson, president, presided. The association will hold its next meeting July 6.

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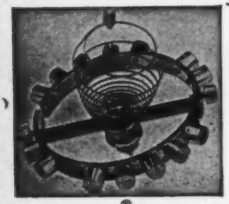

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"Human Relations"

By JOHN J. NOOYEN

I want to express my appreciation for having been given time on this program to speak on a vital subject.

You know there is more to this "Human Relations" than most people realize. Your attitude can either make or break you.

When I talk on this subject I like to direct my remarks to the young men, those who are just coming up and who will take the place of us older men in the business life of the nation.

A couple of weeks ago, I was here in Chicago attending the 30th annual meeting of the United States Chamber of Commerce. Present at this meeting were some of the biggest business and financial geniuses of the world.

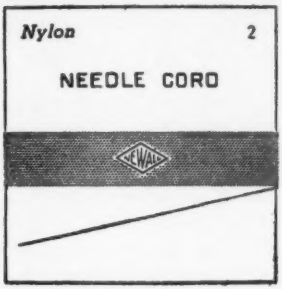
The President of this great organization, Mr. Albert W. Hawkes, is probably one of the best known and best loved men in America. Besides being president of the United States Chamber of Commerce, he is the head of one of the country's largest industries and is also a member of the War Board in Washington.

The final message that he gave to a brilliant gathering at the banquet which closed this most successful meeting, was on, "Human Relations".

Let me give you the exact words he said just before he rapped the gavel for final adjournment. I quote, "Ladies and Gentlemen, I want to leave with you just one more thought which I have reiterated many times during this meeting, and this is it, 'nothing that we can produce and no effort that we put forward, no matter how great, will ever accomplish its purpose unless it is based on the foundation of Human Relations.' (End quote)".

That is what this big, popular, successful man thought of this subject.

Do you think, for a minute, that we would be in this war if we would have had the right kind of human



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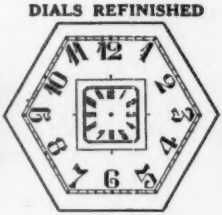

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John J. Bowman, Director

relations? Of course not.

And look at the results. Just imagine if you can, what this has done to our way of life. Think what is happening to all the things our forefathers fought and died for, and handed down to us to enjoy. **Note** What are we going to hand down to those who will follow us.

Some of us in this room will never again see a new model automobile.

All your plans for the future of your children and grand children will have to be changed.

These are serious times' folks, and its going to take a lot of courage and right thinking to survive.

We've been through wars before. We've survived panics and depressions and we will get through this crisis, but it can only be done by the proper understanding of this subject of Human Relations.

Every one must do his part. It is undoubtedly easier to ride through life on the efforts of some one else, but the great satisfaction lies in the fact that you had some part in what ever is accomplished.

Every one wants to be popular and successful—and the only way to attain this end is to cultivate those two cardinal virtues, Kindliness and Friendliness.

If you want other people to like you—you must learn to like other people.

In this connection I want to again quote Mr. Hawkes. The National secretary, Mr. Ralph Bradford, was paying a compliment to Mr. Hawkes at one of the Councillors meetings, and he told of how all those who work for him and with him love him and what Mr. Hawkes thinks of them and how he takes a personal interest in every thing they do.

In reply, Mr. Hawkes said, (quote) "If you can't like the people who work for you and associate with you, and in turn make them like you, its just too bad, because that's about all there is to a happy and successful life." End Quote.

This fact was never more forcibly brought home to me than at this meeting of all those successful leaders of industry.

No wonder they are popular and successful, they have all the necessary attributes.

If you want to gain the respect of others, you must have respect for others.

Speaking ill of others, will only make those who would like to be your friends, suspicious of you.

You can never rise to any great heights by tearing down the accomplishments of another.

A pessimistic view of life makes a man sour and he neither makes nor keeps friends.

The way a man looks at life will make a very great difference who his associates will be. Be an optimist. Be a gentleman.

Don't be vindictive. Learn to be humble. A man who is arrogant and argumentive will never have many friends.

And remember, all the good things we get in this life we will get through the proper application of this principal of Human Relations.

Let's keep alert. Let's strive for perfection as near as possible in every thing we do and above all, let us all do our part.

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THE AMERICAN HOROLOGIST
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Your Public Relations In War-Time

By JOHN T. BARTLETT,
Business Research Specialist

JOHN T. BARTLETT, new member of editorial staff of the American Horologist business research department.

The other day a veteran drive-worker—one of those fellows who year after year—solicits for the Boy Scouts, Chamber of Commerce, Community Chest, Presbyterian (or other) church, and the fund-to-get-band-uniforms, etc., etc., showed me confidentially his "touch" list. I noted two different horologists in the top ten names.

These men can always be counted on to buy tickets for the supper the colored brethren are putting on, to pay for an ad in the high school paper, to contribute to the selectees' cigarette fund, to support, in fact, any worthy cause. Often, besides making a personal pledge, they leave their benches, and counters, when they can ill be spared, and pound the sidewalk, talking other people into making contributions.

This is good public relations stuff. Participation in the worth-while enterprises of one's community is both an obligation and an opportunity. As the latter, it identifies the horologist with humanitarian purposes. It puts his name in the paper in dozens of favorable ways. It brings him the respect and friendship of dozens of community leaders.

There is much more to public relations than this, however—especially in war-time. The horologist should have four main objectives now.

1. **To render patriotic service.** No horologist should be content until he has a load of war effort that will take hours of his personal time each week. He should push war stamps and bonds in his relations with employees and customers. Behind every program to which the government asks his support, he should take his place with enthusiasm. This should be his objective: to set an example for patriotic service which will be unmatched by any other class group.

In relations with the public, he should "sell" government regulations. He should be unselfish, philsophical toward necessary war restrictions. He should help to do a notable job of service for Uncle Sam, and simultaneously, build his profession and business high in the esteem of his community.

2. **To support the home, church, school, law,** in all his relationships with the public. These four institutions are fundamental in our democratic life. In a world of change, they are great stabilizing forces.

3. **To protect and build his good name, and the good name of his business, and the watch-making trade.**

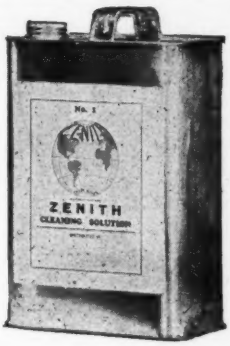
4. **To strengthen private industry in public esteem.**

These should be the horologist's objectives in relations with the public. Newspaper publicity is so important to all of them that special comment is called for.

Cultivate your local newspapers. Become well acquainted with men on the editorial end, especially in desk position. Go fishing with Bill, the city editor; phone him news tips, even though they do not relate at all, perhaps, to your business; invite Bill and Mrs. Bill over for an evening of cards. Find other ways to perform favors.

Against a background of this sort, you won't have difficulty "planting" publicity stories when opportunities arise. In war time, your stories, whether telephoned, told a reporter,

Reading Time: 43 Seconds



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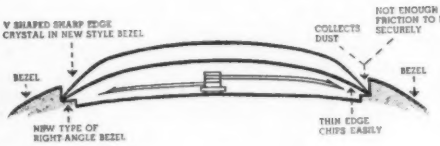
V SHAPED SHARP EDGE CRYSTAL IN NEW STYLE BEZEL
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NEW TYPE OF RIGHT ANGLE BEZEL
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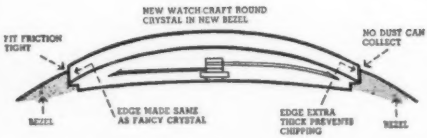
All the most popular case styles have the new type of right angle flat edge bezel. Up to now the old type of V shaped crystal had been used in these bezels. As the illustration shows, this arrangement is very unsatisfactory.



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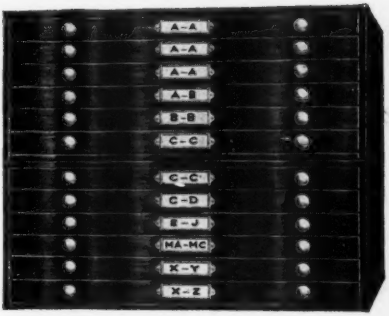

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or turned in all written out (the ideal way if practical) will be concerned with all four public relations' objectives I have listed. Radio newscasts should be culivated in much the way that the newspapers are.

Perhaps there never before was a time in history when conditions were so favorable for securing good publicity. The test of material is —IS IT NEWS?

It's mighty easy to find, and make, news today. Men in watchmaking, jewelry, and other trades, have inspired news stories such as these in recent weeks:

An interview in which an owner commented on the good sportsmanship of Americans in accepting shortages, delays in deliveries, restricted credit terms, etc.

Statistics of a large organization on the many war-time activities of employees.

Ways in which Yankee ingenuity is appearing in supplies, in developing substitutes.

Story with photograph on the departure of an employee for service, incorporating a personal tribute in quotes, by the company head.

Story of the work of employees who have made outstanding records in sale of defense stamps.

Because many newspaper offices are short-handed now, the story which is taken in as prepared copy is often enthusiastically received. It is a simple matter for the editor to edit as needed. Stories already in written form will get, probably, on the average, two or three times as much space as the story which is reported verbally.

Can you "make" news? One institution, established many years, had a number of employees with a very long service. So the manager originated the Old Timers Club. That is a good morale building idea. It automatically assures "events" — picnics, projects, etc.—which make local news. (Example "Brener's Old Timers Club buys War Bonds").

These are the ideas to be constantly sold in newspaper publicity and other ways—that the horologist is progressive, a leader; that he treats his associates well; that he is thoroughly patriotic; that the horological industry is doing a splendid job of public service in war time.

Objective No. 3—Support of the principle of private enterprise—is of momentous importance in war time. Organized groups whose aim is a complete socialistic state after the war are very actively at work. Every horologist should understand the condition. It should be always in his thinking as he plans his public relations. It means that he should so conduct himself that the general public, and the groups into which the public splits up, grow more friendly, rather than less so, to private enterprise.

The threat also dictates in this writer's opinion that business men, must, in an intelligent way, participate actively in the political assemblies, primaries, and elections of 1942. There will be candidates a-plenty who represent our traditional democratic ideals of private enterprise. And everywhere, there will be the other kind of candidates who, put forward by groups interested in revolutionizing the social order in America.

Pressure groups already are at work with their sights on the legislatures of 1943. Some of the issues will be ones in which every reader of THE AMERICAN HOROLOGIST has vital interest. The old rule of business—leave politics to the politicians—will no longer suffice. In war-time, business men must take an intelligent and active part in politics, and, following the rules of the game, must protect themselves.

Among horologists are many who are fair to become excellent public speakers. During the war, they should be active—before luncheon clubs, chamber of commerce, women's, church and other groups. They can so

well represent business that, as public sentiment crystalizes on issues, great influence will be wielded. And they can help to focus consideration on the practical business aspects of national problems.

America at war sorely needs the business wisdom and genius of the country. As cooperative, friendly citizens, let's offer our practical suggestions—and work to put them over!

The Old and New Watchmaker

By W. H. SAMELIUS

Address at U. H. A. A. Convention

Let us go back a few years, say, one generation and compare the old craftsman, his working conditions as compared to our modern watchmaker. The old watchmaker worked with a fiddle-bow lathe, the hand-driven lathe, and then a foot wheel for driving power. He had a Jacot lathe for reducing or polishing pivots, a rounding-up machine for rounding up wheels, a wheel-cutting engine, a fusee-cutting engine, uprighting tool, a depthing tool, a sector for sizing wheels and pinions and an escape wheel-trueing device, special attachments for grinding and polishing or altering the pallet stones. An adjusting rod for setting up mainsprings, jewel-grinding equipment, a hand tool which was rotated by hand for polishing screwheads and any number of special tools for the special work he was called on to do.

His measuring system was not standard and his guages were used more for comparison than actual measurements. All of his equipment was hand-driven, either by means of a drive wheel or a fiddle bow.

Our modern watchmaker is now equipped with an accurate bench lathe, using spring chucks invented in 1865 by Charles Moseley. We have the three-slide tool rest, universal face plate, wheel-cutting attachments, pivot polishers, jewelry calipers which are all made with micrometer adjustments. His lathe and attachments are driven by an electric motor and controlled by a rheostat.

We have the microscope or binoculars for inspecting our work, demagnetizers, staking tools, friction jeweling tools, and standard micrometers. Then again, watches are being made so small that it is necessary to have an extra set of tools for these small watches.

The old master had to be efficient with a verge escapement, cylinder, duplex, double duplex, chronometer and lever escapement in its different forms. The modern watchmaker practically has only the lever escapement to contend with for his every day work, while he might occasionally be called on to clean or repair a chronometer. The other escapements have been practically abandoned and off the market.

Shop conditions for the old watchmakers were not pleasant. There was stove heat and he worked by kerosene lamps. Perhaps he didn't have screen netting for the windows in the early days as we have now, so during the summer he had flies and mosquitos to contend with. His drinking water was brought in from a pump and his working hours were practically from sun-up to late evening hours.
Today the modern watch shop is equipped with air conditioning, electric refrigerated drinking fountains and fluorescent lighting. He works forty hours per week. The old watchmaker did not have the transportation facilities we have. Today's watchmaker can work in a large city and in 15 or 20 minutes find himself out in the open spaces.

To acquire the trade in the early days, there was the apprenticeship system, where the young man would be bound out to an employer from 3 to 5 years, receiving no cmpensation but his room and board and possibly a suit of clothes for Christmas. At the completion of his apprenticeship,

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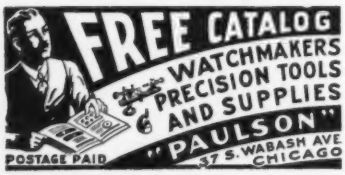


he was considered a journeyman watchmaker and would earn from $10 to $12 per week. Today, a young man taking up the watchmaking trade can attend an accredited school and at the end of 15 or 18 months earn $25 per week to start and our average wage today for the watchmaker runs from $45 to $50 per week.

The old watchmaker had to make all his own material and many special tools as there were no standard watches or finished material on the market. There was some semi-finished material, which by altering or finishing, one could use. Today we can procure practically any piece of material required for all our standard watches, be they American or Swiss, having material jobbers in all large cities giving 24-hour service, either by air mail, special delivery or express.

To regulate his watches, the old watchmaker would have to depend on local solar time until the railroads established standard time. This time was carried throughout the country by Western Union wires direct from the Naval Observatory at Arlington, Md., 11 a. m. each day.

Perhaps some of your older watchmakers remember going down to the railroad depot at 11 o'clock, getting the correct time in order to set the shop regulator on time.

Today, we have standard time broadcast over the radio by several stations. The Elgin National Watch Co. also broadcasts the time and we all know about the radio, each program broadcasting correct time to the second about every 15 minutes, a convenient way for the watchmaker to keep check on his regulator. We now have the modern timing machine which tells us how accurate the watch is keeping time and by the printed charts the machine records we can tell what mechanical errors exist in the escapement, poising of the balance or hairspring. It also saves us considerable time as we can regulate the watch to correct time right on the machine and in few minutes have the

watch ready for delivery, where in the past it would take possibly several days to do the same work. Our early watchmakers had mostly large watches to handle and when they repaired an O-size watch that was looked on as something exceptionally small, and a man capable of handling these small watches was really considered a master watchmaker. In the older days, the 15-jewel watch was considered full-jeweled. Today, we have 16S watches, which are considered large, for railroad use; and down to baguette or 26-0, and the biggest percentage of our work is carried on the smaller watches. They are from 15 to 21 jewels.

The method of cleaning a watch in the older days was to cover the plates with a solution of chalk and ammonia and then with a watch brush; brush off the chalk and ammonia until the plates were bright and then spend considerable time with pegwood, pegging out the chalk from crevices and corners that the brush would not reach. We would often see the watchmaker sitting in a cloud of white dust.

Today, with our new methods, we have the cleaning machine, cleaning solutions and dryers whereby we can clean the watch and all the small parts simultaneously, pegging out the jewel holes afterwards, saving time and having a much better job. Of late, we have a new cleaning machine on the market that automatically lifts the basket from one solution to the next and so on through the series of solutions and dryers and when the parts are finally dried, the cleaning machine automatically stops.

Watchmakers guilds have existed throughout the hisory of watchmaking. The purpose of the early guilds was much the same as those today, to assist the young watchmaker and endeavor to hold up the standards of watchmaking. These guilds were local, having no affiliations. Today we have watchmakers' guilds in all large cities, these cities forming a state organization and in turn the state organizations have formed the National Organization, known as the United Horological Association of America.

All these state associations are now endeavoring to introduce state licensing laws. These laws are for the protection of the employer, that he may be assured of securing a good watchmaker. The public is likewise protected, as their watches will be in competent hands and the competent watchmaker will be protected against the incompetent.

Three of our states have secured the licensing laws; each state having an examining board that has set up a standard for watchmaking and any watchmaker entering that state to practice his profession must pass the examination as set up by the Board.

If we take a summary comparing the old watchmaker with the new, we must admit that the old watchmaker had a more general knowledge of the various styles of escapements and gears and was called on for considerable skill to reproduce any and all parts of the watch from whatever country the watch had its origin. Generally speaking, these watches were all of the larger sizes and did not keep the close or accurate time that our modern watches do today.

Our modern watchmaker today is called on to handle much smaller watches, capable of keeping accurate time, and he must have a technical understanding what makes the watch keep time and to understand what adjustments or careful workmanship it takes to bring these small watches to time. With all respects to the old watchmaker, the new watchmaker must have considerable more skill to handle the small balances and hairsprings and make the necessary adjustments to the escapements, even though he is not called on to make the parts.

This doesn't necessarily mean that he couldn't make the parts if called on to do so, and it would be folly to make parts for our modern watches when

ready-made interchangeable material can be had so cheap and quickly.

I believe our modern watchmaker deserves all the credit due him for his skill, patience and workmanship displayed in these fast-moving times, as the public is so time-conscious that seconds count.

Five Tooth Escape Wheel

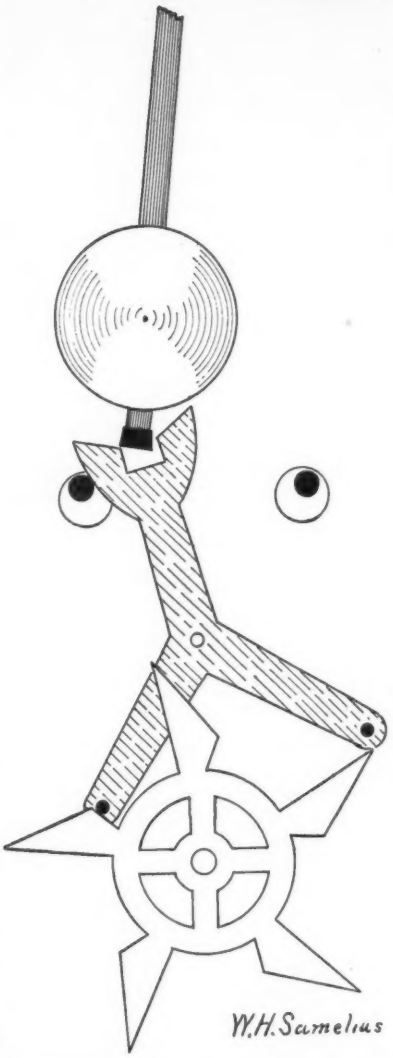
By W. H. SAMELIUS, *Director*
Elgin Watchmakers College

In the early days when Horology was in its infancy and the Verge escapement was universally used, the pocket watch was not a reliable timekeeper, so the English Horologists turned their efforts to clockmaking, the impression that if one had a reliable timepiece in the house, he could always set his watch by it.

The American Horologist went in for a reliable pocket piece and instead, produced cheaper clocks, the idea being that a watch in the pocket was always in service and must be depended on, while the house clock could be set, should it vary.

Among the many escapements that were employed to drive a pendulum, we find the five tooth lever escapement suspended below the pendulum and connected to the end of the pendulum, very much the same as the balance is connected to the lever in our modern watch.

The reason for using the five tooth escapement, allowed considerable angular motion in order to get a deep intersection for the end of the pendulum while passing through the fork slot. This style of escapement was used for short pendulum clocks. The objection to this style of escapement was that the pendulum was pivoted, the weight of the pendulum bob creating considerable pivot friction, consequently requiring excessive power to drive same, wearing out train pivots and pinions. This system was soon abandoned. Clocks of this kind were made in England during the early 1800's.



How You Can Best Serve America As a Watchmaker

Address given at U. H. A. of A. Convention, by W. J. Watkins chief instructor, American School of Aircraft Instruments

Mr. Chairman and Gentlemen:

It is indeed a pleasure to be able to speak to you again at your National Convention. When I spoke to this

Convention a year ago we were at peace and the text of my talk was "How Watchmakers Could Profit by Turning to Aviation in the Specialized Field of Aircraft Instruments," but today we are at war and therefore we must have a less selfish point of view and place the country above self. I would like, therefore, to speak for a few minutes on the subject of "How You Can Best Serve America as Watchmakers."

I told you a year ago about the great need for Aircraft Instrument Mechanics, but today, because of the war, that need has been increased many times over. For example, a year ago, it was practically impossible for a watchmaker to enter this field without specialized training, but today many watchmakers are being taken into the work without specialized training. There are, however, many good reasons why, for your own best good as well as for the good of our country, you should prepare yourself by specialized training.

Your training and experience in watchmaking has developed your ability to use your hands and do delicate mechanical work which is very necessary in Aircraft Instrument Work. For this reason watchmakers have long been considered very good material for Aircraft Instrument Mechanics. However, this mechanical ability must be augmented by a thorough theoretical knowledge to accomplish complete success. In watchmaking you are working with only one basic principle, that of spring tension, while in Aircraft Instruments there are many and varied physical laws applied, such as barometic pressures, differential pressures, hydraulics, and rigidity and precision of Gyroscopic as well as many phases of electricity, such as magnetism, induction, generators and Thermocouples, to name only a few.

You can readily see that for complete success the Aircraft Instrument mechanic must have more than just mechanical ability; he must have a thorough knowledge of the physical laws which are the motivating force of the mechanical devices.

You may be able to qualify as an instrument mechanic on your watchmaking experience alone, and if so you will be taken into the shop and taught enough to be able to do a certain type of work and then be assigned to the job. This, of course, is not the most desirable method either for you or the Government, but it is the only solution that has yet been found to solve this problem in Civil Service bases. If, however, the watchmakers will prepare themselves by training for the position of Aircraft Instrument mechanic, they will be well prepared to do a good job for the country and at the same time be able to advance to positions of responsibility and thereby assure success and permanency for themselves not only for the present but also for the future.

This problem of securing qualified instrument mechanics is also being faced by the Airlines and private repair stations, and although for the most part they are unable to follow the method of Civil Service because of the tremendous cost, in some cases it has been a necessity since there are not enough trained mechanics to fill the demand. Here again the most economical policy is to train the mechanic to do just one phase of the work. This, however, is not the most desirable thing from the mechanic's point of view because his advancement is limited.

If, however, he has prepared himself by a thorough course of training he has the solid foundation upon which to build a career as an Aircraft Instrument Mechanic.

To illustrate my point I would like to give you a few examples. Last year at the Convention in Duluth I talked to a young man who had recently finished a course of training in watchmaking and was ready to start out in life but wasn't entirely satisfied with the outlook. He became very interested in Aircraft Instru-

ments and by the time I returned to California he had enrolled for training at American School of Aircraft Instruments. He completed his training, during which he proved himself to be an excellent mechanic, and although he did not have the advantage of a college education, he was able to acquire a thorough understanding of instrument theory because of the authentic texts which are the result of many years of work and experience in the training of Aircraft Instrument Mechanics. He completed his course a few months ago and to the best of my knowledge he is now on a Foreign Service Assignment at Four Thousand Dollars a year and all expenses paid.

I recently handled some Gyropilot equipment which had been overhauled and inspected at a Civil Service Base. You can imagine my pleasure at finding that the Inspector who had signed the inspection ticket was one of my students who had graduated less than a year and a half ago. These are not unusual cases but are typical examples of success of graduates of American School of Aircraft Instruments.

For many years now the demand for our graduates has been much greater than we could supply although we have increased our capacity several times and continue to operate with full classes. My most serious problem is not securing jobs for the graduates, but getting enough graduates for the jobs. This situation is a serious one and is one that will, in all probability, continue for some time because it is impossible to create an instrument school overnight as is done in some other phases of Aviation.

It is being tried, however, and there have been many schools started in recent months in an attempt to cash in on this situation.

The development of text material and a course of instruction require a great deal of time and experience which cannot be developed overnight. The development of an instrument school is also a very costly undertaking and even if the money is available it is impossible to secure a supply of instruments on short notice. The demand for instruments is very great and since the Government needs so many for Military Planes there are only a few available for private use and it is from this supply that the instrument school must secure its instruments for instructional purposes. There are, of course, old obsolete

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instruments available, but their use in instruction is limited.

I have mentioned this somewhat controversial subject in an attempt to save the wasting of time and money in fly-by-night courses of training. There are good schools in this work where a man can get a thorough course of training. If a man is interested in instrument training he can verify a school's standing by checking with the Civil Service Department, the Civil Aeronautics Administration, Better Business Bureaus and Chambers of Commerce.

There is one question which naturally enters the mind of a man who contemplates entering the field of Aircraft Instruments and that is: "What does the future hold?"

In closing I would like to say a few words on this subject.

Although we are experiencing a boom in **construction** of Aircraft, the **use** of Aircraft is in its infancy. At the present time commercial Aviation is being curtailed because it is necessary to devote our energy to the war effort. At present we are building planes, many of which will be lost, but after the emergency is past we will build planes that will continue to operate for indefinite time. Any phase of work which has to do with maintenance of Aircraft will therefore continue to be in demand and instruments are one of the most important phases of this work. An official of one of the major Airlines told me recently that their Company anticipated a growth of 1,000% in the first ten years following the termination of the war, and that Company is considered to be one of the most conservative Companies.

So, gentlemen, let me leave this thought with you. In Aircraft Instruments you will find a field for which your talent is well suited and one in which you can render a distinct service to your country and at the same time have a trade that will be profitable not only during this emergency but for many years to come

Address On Aero Instruments Before Members of The U.H.A.A's Convention, Morrison Hotel, May 18, 1942

By C. H. SMITH,
President Chicago School of Aircraft Instruments

This is the first time I have had the privilege of addressing your group and I'm not quite sure, yet, what on earth could have made your program committee think I could say anything that would be interesting to you. However, I like to hear myself talk altogether too well to pass up an opportunity like this, so I'm afraid you will have to endure the sound of my voice for the next couple of minutes, at least.

Aviation is a magic word, these days. Anything, or anybody, connected with aviation is grabbed by a public that is literally starving for information, and more information, about what is going on in the air. What abuot our airplanes? Are they as good as those the Germans have—or the Japs? How many bombing planes have we got now? Is it true that we have a new pursuit plane that will go 500 miles an hour? And, how about that famous Norden bombsight of ours—"I heard it wasn't so hot, after all?"

Unfortunately, I can't answer any of those questions. I am not a flyer. I don't build airplanes. And, in all of my life, I've never see a German or Jap plane, and I surely hope I never have to,—at least not one that I know has a load of bombs in it. But—I am in Aviation, at least in an indirect way and, in what I believe is the most fascinating branch of this most romantic of all industries. I teach men—both civilian and soldiers—how to overhaul maintain, and keep in correct operation the dozens of delicate instrument machanisms that make it possible for airplanes to fly, and for the men in them to keep alive. And, I am

AERONAUTICAL INSTRUMENT SERVICE

Aircraft Instruments

EDITOR'S NOTE—Aeronautical Instrument Service is a subject untouched by publications in the Horological field, or in fact by any publication. In September, 1938, THE AMERICAN HOROLOGIST inaugurated such an educational service via prepared illustrated lectures to be used by U. H. A. A. organizations for the purpose of broadening our members' scope of knowledge in this field, which offered additional remuneration to those far-sighted enough to avail themselves of such knowledge.

(We have eliminated our aeronautical instrument article for this month in order to give you two addresses by prominent men in the aeronautical instrument field. Instrument articles will be resumed next issue.)

proud—very proud—of the work I am doing, and of the privilege that has been given me of contributing, even though it may be in a small way, toward the great effort to keep this country of ours free, so the people like you and I can live the way we want to.

But—if you had told me, a year ago, that I would be connected with aviation in even the most remote sort of way, I'm sure I would have laughed in your face. Although I have been interested in airplanes for most of my life and have studied their operation in a purely theoretical sort of way as a man will any subject which he finds fascinating. I had never been in the air but once in my life and didn't know many people who had. However, fate seems to have a peculiar way of preparing you in advance for what is to come, without your even knowing about it.

Most of you who are sitting out in front of me have spent your lives learning to become watchmakers or jewelers. Did any of you ever guess that in leading you into watchmaking, Fate was preparing you to serve your country in time of war? I venture to say that you didn't, any more than I guessed that when Fate lead me into educational work as a kid just out of college, that she was preparing me to train men for aircraft instrument work at some future time when my country needed such men so badly.

But, that's the way things work. And, now, because I've spent nearly twenty years organizing and conducting industrial training programs, it is my privilege to use the knowledge and experience that I have acquired for my country's benefit. And, in just exactly the same way, you have an opportunity to use the knowledge and experience that you have acquired in your work, to help keep those men who are out there flying for you and for me, in the air and safe, and to help them materially in fulfilling the missions that are assigned to them. For you already have most of the special skills that an instrument technician must have in order to disassemble and repair the delicate mechanisms that the used in aircraft instruments.

You are accustomed to working with small precision parts, you know how to use small tools, to operate a jeweler's lathe, to do broaching and peining, how to polish pivots, straighten hair springs, make handstaffs and pointers, and hundreds of other things that every man who has not had watchmaking experience has to learn before he can become a competent instrument technician. True—there are many things about aircraft instruments that you don't know—and much that you would have to learn before you could become an instrument technician—but you already have the things that it takes the most time to acquire and that we find it hardest to teach a man in the limited amount of time that we have for doing the job.

So—I say to you that there is a place where you can make a real contribution to your country—where you

can fill a job for which men are needed as badly as for any other there is—and in which you can, at the same time, establish a grand future for yourself.

Let me tell you something about aircraft instruments and the part that they play in flying.

To begin with, you should understand that there is a vast difference between flying a light plane of the type that you generally see around private airports and the mighty bombing planes that are used in our air force, just as there is as much difference between night and day; between the planes that were flown in the last war and the ones that we are using now. When airplanes had small, simple motors, much like those that are used in automobiles, we did not need many instruments to tell us whether they were running correctly or not. And, when our planes would only go 60 or 70 miles an hour, our own senses were perfectly satisfactory for telling us whether or not we were flying properly. And, when we couldn't go more than a few hundred feet off the ground, it wasn't necessary to have an instrument to tell us how high we were—we could always see pretty well what was going on. Then, too, when we weren't going any place in particular, we didn't have to go up if the weather was bad, so we didn't need instruments to guide us through fog and ice. Above all, since our flying was primarily for pleasure, we certainly didn't have to have equipment that would make it possible for us to fly through enemy country and pick out a particular spot on which to drop bombs.

So—our early airplanes had practically no instruments—an airspeed indicator, an altimeter (not a very good one, probably), an oil pressure gauge, a fuel gauge, and perhaps a compass. And, since it flys under similar conditions, that's about all our average light private plane of today has. You can see, therefore, that except for the commercial airlines, instruments

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haven't played such a tremendous part in civilian flying. But—in war it is a vastly different thing.

Now we are flying planes with mighty motors that cost thousands of dollars to build, and that use up as much as 25 gallons of gasoline an hour. Moreover, we don't have just one motor to a plane—we have two or four, and may have six or eight before long. Now we are flying planes that carry ten or twelve tons of bombs that fly regularly at heights of six or seven miles above the ground, and at speeds well over 4,00 miles per hour. Above all, we must fly under any and all conditions—in rain, snow and fog —secretly—over country about which we know nothing. And, we can't miss —we must get to the exact spot at which our objective lies and then get back home again. Oh, there are so many things that we must do now that no one but an airline pilot has to do in peace time. And, we have reached a point where we can no longer rely on our senses to guide us, because at 40,000 feet up in the air, our senses don't act as they do on the ground, and we are not tuned to think in terms of 500 miles per hour. Instruments must take the place of those senses—and they must be accurate and unfailing.

As an example of what I mean, let's follow a bombing plane on one of its flights. Let's say our plane has instructions to leave some spot in Australia and fly a thousand miles out over the water to an enemy location, drop a load of bombs and come back again. Somewhere along the route the weather will be bad, there may be fog and rain and ice. It will be night because we can't risk being spotted in daylight by an enemy plane. We won't be able to see where we are going, and we may not even be able to see our objective when we get to it. Yet, that's our job and we must do it.

First of all, the big plane will be wheeledout onto a runway, and a mechanic will start warming up our motors. He won't trust to luck. He'll run

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the motors until he sees that they are exactly the right temperature—he'll check oil pressure and fuel pressure, and a half dozen other things, before he lets the plane take off into the air. There is a group of instruments that he will watch, and when they all read correctly, he will give the signal to take off.

Now we are taking off, and now we rely on another group of instruments to tell us what we are doing. Some instruments will tell us that our motors are operating at correct speeds —that all four of them are synchronized, because we can't run one motor at one speed and the others at different speeds—we'd either shake the plane to pieces or pile up, one or the other. Other instruments will tell us what our air speed is, because that, after all, is the thing that determines whether or not our plane will lift off the ground. We want to watch another instrument to tell how fast we are climbing, because if we climb too fast we can stall and crash, or if we climb too slowly, we may hit something. Then there are other instruments that tell us when our landing gear is up, whether we are flying in a level altitude, and whether or not all of the different parts of the plane are functioning correctly.

We are out over the ocean now, searching for a tiny little island. Now we rely on our compasses and gyroscopic instruments—those marvels of ingenuity—for navigation. Now we rely on altimeters, vertical speed indicators, turn and bank indicators, driftmeters, and a dozen other instruments to tell us where we are going and when we will get there—not to mention temperature indicators, tachometers, fuel flow meters, and what not, that tell us when our motors are behaving incorrectly, and pressure gauges, oxygen regulators, etc., that enable us to live and breathe at 40,000 feet in the air.

Yes, flying the modern military airplane, or the modern commercial airliner is a matter of instruments. On an ordinary airliner there are approximately seventy-five instruments, not counting dozens of switches, warning lines and other devices. On a bomber there are another fifteen or twenty. And, if just one fails at a vital minute, a quarter of a million dollars worth of airplane is lost, nine or ten lives are gone, and our mission is a failure. Or, if one vital instrument is not functioning correctly, we cannot even take off on our flight.

And, instruments do fail. You've seen the insides of watches and cloaks. You know what mechanism of that type are like. You know they break off easily and get out of order at the darndest times. And, you can understand that when you add to those mechanisms delicate diaphrams, sensitive balancing devices, minute electrical motors and various pressure and suction lines, and then subject the whole thing to the vibrations and shocks that come with flying an airplane, not to mention extreme temperature changes, humidity, etc., you are going to have trouble and plenty of it. With a hundred and eighty thousand military planes in service, each one having from fifty to a hundred such instruments, you figure out how much instrument repair work there will be, and how many men will be needed for the job.

Now, here is a funny thing. From the minute that we began our preparations for war, it seems to have been understood that we would need thousands of trained experts to over haul and repair airplanes, motors, and everything else connected with aviation—except instruments. It almost looks as though instruments were forgotten altogether. Then, all of a sudden the real need for instrument technicians became apparent. Now the big cry is for trained instrument men.

And, here is another funny thing. Although there are hundreds of schools in this country teaching men to fly and training engine mechanics, or aircraft assembly and fabrication men, there are almost no schools set

up to train instrument technicians. When the Army Air Force sought schools to train men of the Air Force as instrument technicians for overseas duty, they could only find two schools in the entire United States that were properly equipped to handle the job—our own, the Chicago school of Aircraft Instruments, and the American School of Aircraft Instruments, whose Chief Instructor is also on this program and going to speak to you. Worst of all, nothing can be done about it now, because the thousands of dollars worth of instruments and special training equipment that are required for such a school cannot be obtained today for love nor money. New instrument schools simply cannot be created now.

Consequently, we who happened to be established at the beginning, now have our facilities taxed to the utmost to turn out the civilians and enlisted men that are needed. By the end of June, we will have more than 500 men in training in our school, about half of them enlisted men of the Air Force. But, although the Air Force is eager to have us train as many enlisted men as possible, they have asked us not to discontinue our civilian school, because they need civilians just about as badly as they need enlisted men.

The Army, you see, relys entirely on civilians to handle the overhaul and repair of its instruments in this country. The Air Force operates about sixteen overhaul depots in the United States. When an instrment goes bad in a plane, it is removed from that plane and a new one put in. Then the instrument is sent to one of these depots to be repaired. The employees of all of these depots are civilians, in Civil Service, and, of course, at present, there are no where near enough trained men to man them. We are turning out trained civilians as rapidly as we can and most of them are going into these depots — our entire graduating class of 17 men, in April, went to the Fairfield Air Depot, at Dayton, Ohio, and the men who will graduate this month have already received their appointments for similar jobs at other depots. But, even we can't begin to turn out the men who are needed.

The instrument manufacturers need trained instrument technicians too, to serve as inspectors, calibrators, and assembly men. The airplane manufacturers need them for installation

(Continued on Page 41)

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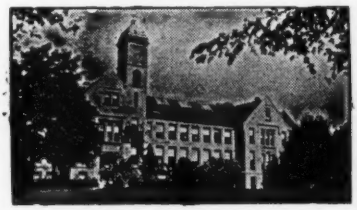

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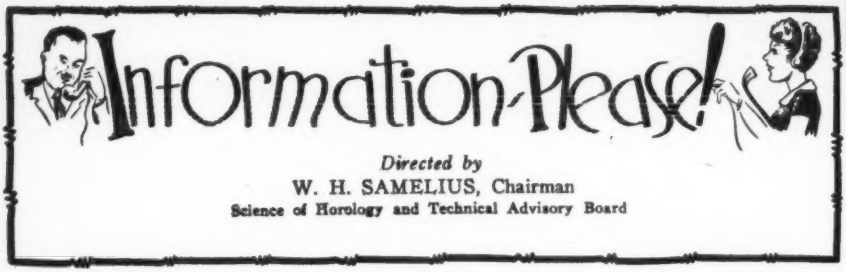

Directed by
W. H. SAMELIUS, Chairman
Science of Horology and Technical Advisory Board

RHL—Can you tell me how much energy is exerted on the pallet jewel when the mainspring is up and when the mainspring is down?

Answer: There is one way to determine the amount of energy on the pallet. Wind the mainspring, which is hooked against a steel spring scale and read what pull the spring has. Then calculate the reduction by the increase in motion. This was done by a Swiss Professor and found that in the watch under test, the mainspring when fully wound exerted a force equivalent to four ounces, which divided by 18,000, plus the trainfriction, gives the pallets a force of about three grains. Naturally, this could not be taken as a constant, it is merely a result of testing that particular watch and the force would vary in other watches in keeping with the thickness, length, and width of every spring, also with the train friction of every movement. The diameters of pivots½ their finish and the bearing they run in as well as the smoothness of the gearing are all factors to be considered.

AD:—I am thinking of opening a repair shop, doing trade work. Do you think one could work up a trade and how would one proceed?

Answer: In regard to trade watch work, would say, as this is largely mail business, your location is not so important providing you have a large stock of material on hand so that work can be handled quickly without waiting for material. There is but one way to build up a trade shop. That is by solicitation from neighboring towns and advertising thru the American Horologist or other trade journals, extending your operation as you have accumulated experience and a working force. It should be borne in mind that the average trade shop gets the work the ordinary watchmaker does not care to do, and, therefore, we would recommend that you take a position first in some trade shop where you will become proficient and fast before attempting to open a trade shop of your own. A trade shop watchmaker must be capable of handling poor or unusual watches quickly and economically.

CH:—Can you tell who Thomas Wagstaff was. Was he the inventor of the wag on the wall.

Answer:—"Wag on the Wall" was a common name among the Scotch and English people for a clock with an exposed pendulum. The clock movement was contained in a square case and the pendulum swung free below the works. It had nothing to do with any particular manufacturer.

Thomas Wagstaff was a member of the Clockmakers Company in London from 1766 to 1794. He made long case clocks of the Grandfather type, a number of these clocks being brought to America during the emigration of the Quakers or the Society of Friends, as the Sect was then called. A number of these clocks are still in existence in Pennsylvania, Maryland and New York.

(Continued from Page 39)

and adjustment work. The airlines need them, beacause the airlines are handling a greater load than ever, and in addition, helping the Air Force with much of its work.

All in all, instrument men are needed terribly for the war effort. And, this fact, can mean much to many of you. Because your training and the special skills you already have, you can become a better instrument man, in a shorter time, than the ordinary layman possibly can. Furthermore, this is, perhaps, the opportunity of a life-time for a lot of men. Because, when this war is over, it seems certain that aviation is going to be our country's greatest industry—just as the automobile was after the last war. And, the man who gets into aviation now is getting in on the ground floor. He should have opportunity before him, if ever a man did. Furthermore, there are not going to be any too many instrument men, for the plain and simple reason that there are not and cannot be enough schools to train them.

So, if you would like to use your skill and training to help your country in its time of war—if you would like to establish yourself in our next great industry at the same time—look into this matter of aircraft instrument work. You will find it as fascinating as anything you ever did, and right up your alley. Most important, though, you will be on the job helping to "Keep Them Flying."

Wichita Horological Guild

Had a big dinner meeting, June 17, with the largest attendance on record. Everyone had a good meal.

After the dinner, Mr. Brasfield told of his trip to the National Convention.

The material situation, the O. P. A., and other timely topics were discussed.

"MacArthur Month"

The "MacArthur Month" campaign, conducted by Bausch & Lomb to stimulate the flow of ideas to save time, labor, and materials and improve manufacturing processes, produced 2,035 ideas in thirty working days. This was at the rate of about 68 per day as against approximately ten a day received under ordinary circumstances. The returns in the final week exceeded those for the full year of 1941.

The company has paid out a total of $12,374 of which $10,824 covered the double awards for ideas and $1,550 for ten grand prizes for the best ideas. The average amount paid out for the thirty working days was approximately $412 per day.

The actual total of these awards will run much higher, however, since in many cases only preliminary awards could be made pending investigation and experimentation on the ideas and computation of their expected savings.

In addition to the commendation of Donald Nelson, a wire directed to the employees of Bausch & Lomb was received from Lieut. Gen. Henry H. Arnold, Chief of the Army Air Force, which read: "Your important optical equipment is helping our aviators to map Jap and Nazi objectives and to fly over them with accuracy and safety. Every time we bomb the Axis you help get the bombs there. Keep your products coming and we'll keep striking at the Axis."

Indiana Watchmakers Association

Two hundred Watchmakers attended the Ninth Annual Convention, June 14, 1942, at Hotel Antlers, Indianapolis, Indiana.

Mr. Z. O. Craig of Crawfordsville was elected president of the Association, succeeding William J. Rhooda.

Other officers elected were: Frank A. Kroetz of Valparaiso, vice-presi-

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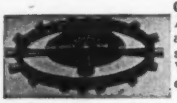

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dent; Thomas E. Cook of Indianapolis, secretary-treasurer, and L. R. Douglas of Indianapolis, managing director.

Directors elected were: H. Walter Schaefer and Marcus Furstenburg, both of Indianapolis; William J. Olson of Gary; Charles E. Carbaugh of Auburn; Herman L. Lodde of New Albany; Glen McCrea of South Bend; Paul R. Sheddrick of Middletown; J. B. Groves of Evansville; Walter H. Klauss of Fort Wayne; Edison Abbott of Kokomo; Alfred Schoenman of Peru; John F. Holtman of Seymour; and Frank J. Marter of Crawfordsville.

Central Missouri Horological Guild

Held their regular meeting, June 18, which was their third year of organization.

The following officers were elected: Frank Lamb, of Columbia, President; Claude West, of Fulton, Vice-President; A. Blieden, of Jefferson City, Treasurer; Clinton Holt, of Jefferson City, Secretary.

Their next meeting will be a dinner dance, and will be held July 16, in Columbia.

The retiring president was presented with a gold key for his two years' service.

Nebraska Horological Association Officers

C. W. CHASE
President

FRANK K. NOSKER
Secretary

Staleness

(There is a Self-Sought Tonic for it)

By MAURICE C. MOORE

Staleness—how to defeat that?

One becomes aware that he is in that state and he says: "Naturally, because I am physically and mentally tired."

But I think this is the case—we exaggerate the actuality of physical and mental fatigue.

I would describe it rather as a psychic state of the moment, an obsessing idea that is to say, much of it often much more so than an actual unavoidable condition which really cannot be altered except by the "complete rest" that the doctors prescribe.

How powerfully ideas (which may not be facts at all) rule our lives! I think: "I am equal to such and such an effort," or "I am not equal to the effort," and whichever idea has me most strongly in its grip determines whether I shall make the effort or not. "I am **not** equal to the effort," is, I believe, seldom true. It is a piece of humbugging my brain has done. It objects to further work. But in fact, the average human brain is equal to doing an inconceivably greater amount of work than, for most of its life, it is ever called upon to do and that without injury. It would more often be truer to say: "M**y inclination** is against making the effort."

I agree that to many this will look like nonsense.

But that is only because this idea of having only a certain measureable fund of mental and physical energy has got the bit between its teeth.

Have you ever seen what a shock is able to do to a tired man, to one who would fervently assure you that he hasn't an ounce of anything left in him, and thoroughly and honestly believes it?

I have seen a shock wake up such a man so that he became, without any interval or rest from his declared and obvious-to-see fatigue, a new man, braced, effective, a Trojan.

Where has his "staleness" gone?

Simply, his mind has been forced away from its self-hypnotism.

Certainly he had all this reserve of energy in him; the shock did not give it to him, only called it forth.

We may think over this if we feel that we are not getting enough out of ourselves.

If your house caught fire, you would be able to jump into extraordinary activity, although you had only that moment gone to bed, professing yourself to be "whacked to the wide."

And all the while the blaze lasted you would be able to keep on for hours, even for days, feeling no weakening—unless you let your imagination get the upper hand and convince you that you were an exhausted man.

Try the self-sought mental tonic for staleness.

Get the new big burst of interest that is equivalent to an externally-imposed shock.

Our minds hoodwink us. Half of what they say about our used-up-edness isn't true.

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Doctor of Watches

(*For Jes I. Hansen*)

The ills of watches well he understands,
And clocks' indispositions are quite clear
To this watch doctor by whose skillful hands
Their ailments, new or chronic, disappear.

No matter if their pulse beats fast or slow,
Or they maintain a silence absolute,
Or if a striking clock seems not to know
When it should speak, and when to remain mute—

His diagnostic mind detects what's wrong;

His sensitive fingers probe, with keen insight
Adjusting this or that; it is not long
Until again the patient feels all right.

No watch or clock holds secrets hid from him;
So shall it be until his eyes grow dim.
—AGNES C. HOLM.

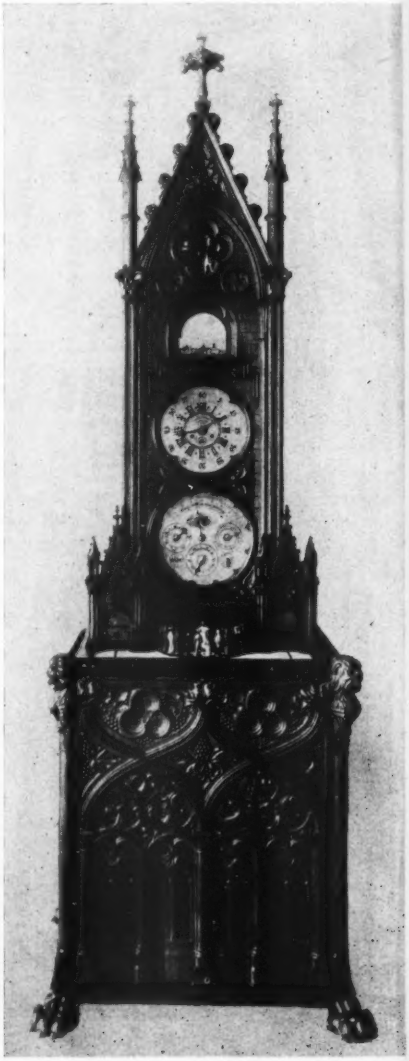
Unusual Clocks

By MRS. ETHEL R. ADAMSON

Switzerland has always been famous for its beautiful and ingenious timepieces. A few years ago, while visiting Lausanne, we discovered one of these fascinating products of the clockmaker's skill in the window of a jeweler.

This clock, stands twelve feet in height, is made of handsomely carved black walnut, and modeled along Gothic lines of architecture. On its tower are three dials; while on the dial below is registered the day of the week, the month, the season, and the year.

In the belfry, a little mannikin taps on a bell every fifteen minutes —once, twice, or three times, dependent on the numbers of quarters past



Instrument Manuel Aviation

(In 13 Parts)

General notes on Instrument Repair.

This publication describes the construction, use and maintenance of instruments used in aeroplanes, and of instruments used on the ground associated with those in aeroplanes.

This book completes the man's Aeronautical Instrument library.

Those who are interested or engaged in Aeronautical Instrument work should not be without this volume.

There are 396 pages with hundreds of illustration. Price, $5.00.

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the hour. On the even hour, a music box inside begins to play, and from the side door on the right, appear the twelve apostles, marching in procession toward the opposite door. When the first has reached it, they pause to await the benediction of Christ who appears in the central doorway with outstretched hands. After He has retired, the apostles continue their march, disappearing within the doorway to the left. The music once more plays, and now comes forth a bridal party, dressed in the colorful native costumes of the various Swiss cantons. With their exit, the performance ends, to be repeated when another hour has come around.

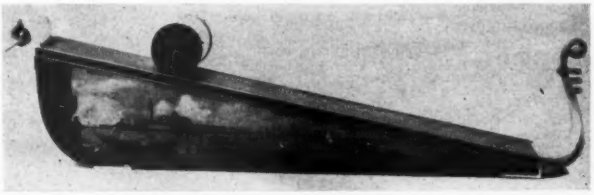
An ingenious clock was to be seen some time ago in the shop window of a Swiss watchmaker. This is known as the "Mysterious Circulator" or "Chronological Equilibrium." This striking timepiece consists of an inclined plane, on which are indicated the seven days of the week, and the twenty-four hours in each; and a weighted cylinder to which is attached the needle or hand. As the cylinder slowly rolls downward, the hand points to the time as marked on the plane. This clock does not require winding-up; for when the cylinder has finished its course at the end of a week, it is simply placed at the top of the plane again.

Jacques Kreisler News

Philip Paul, who has been covering the Southern district for Jacques Kreisler Manufacturing Corporation, North Bergen, N. J., was presented with a bouncing boy by Mrs. Paul on June 7th. Kenneth Marshall Paul weighed in at 6 lbs., 7 oz.

Jack Foreman, Western salesman for Jacques Kreisler Manufacturing Corporation, North Bergen, N. J., has recently been appointed to take care of the Texas territory formerly covered by Harry Harnick. Mr. Harnick joined Uncle Sam's Service about two months ago. Reed Botts, another Kreisler salesman, has been assigned Louisiana and Arkansas, which were also formerly covered by Mr. Harnick.

Elliott Loew, who succeeded J. Fraley Bermond as advertising and sales promotion Manager of Jacques Kreisler Manufacturing Corporation, North Bergen, N. J., was inducted into the Army on May 20, at Fort Dix, N. J. Private Loew, whose hobby as a civilian was flying, already had 75 hours in the air towards his pilot's license, when he entered the military service. He is now in Technical school Squadron 583 Training School Squad 168, of Army Air Force, Miami Beach, Florida. Mr. Bermond is in officer's training at the Quartermaster School, Camp Lee. Virginin.



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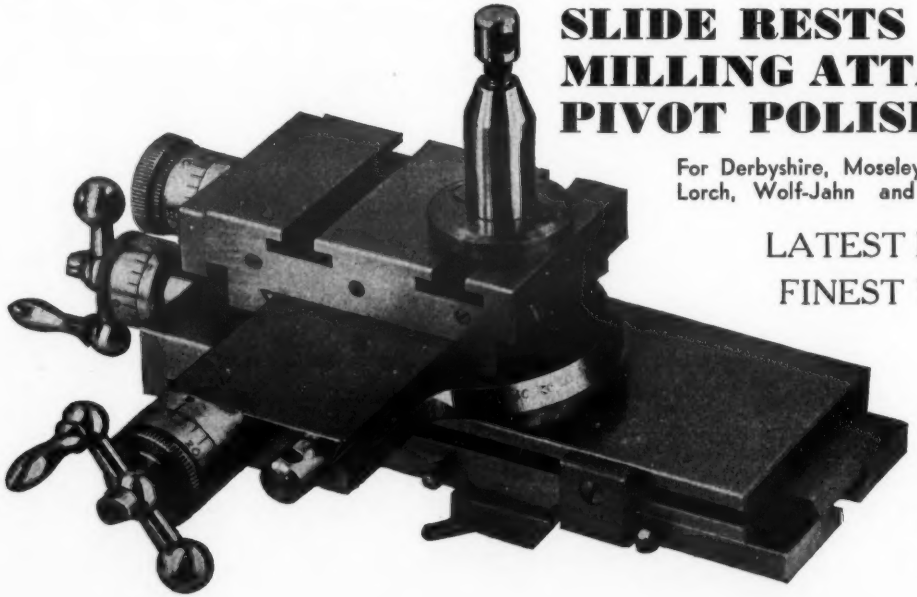

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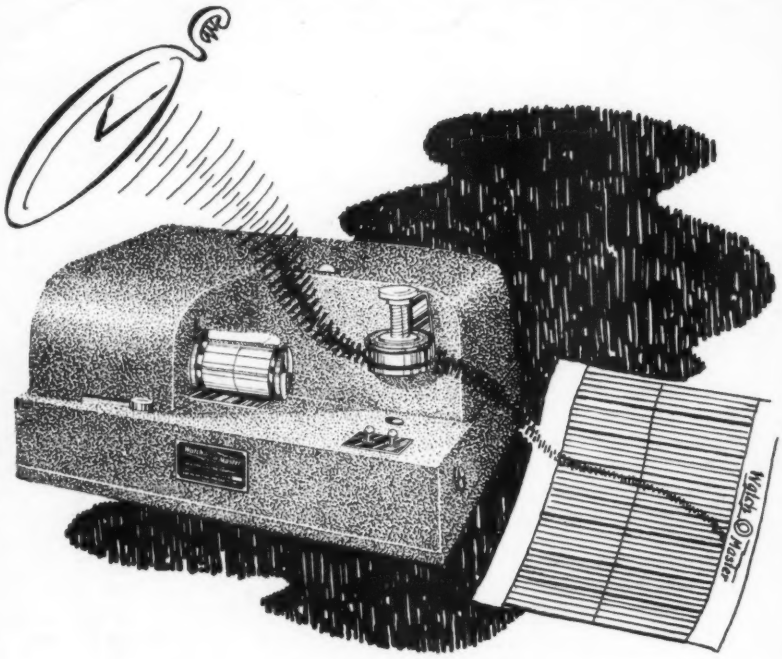

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